WE CLAIM:

1. A method of synchronizing with a pattern sequence, the method comprising:

a first correlation step of correlating symbols of a first pattern sequence, the symbols comprising amplitude and phase information, thereby obtaining a first differential phase information sequence;

a second correlation step of correlating symbols of a second pattern sequence, the symbols comprising amplitude and phase information, thereby obtaining a second differential phase information sequence;

a third correlation step of correlating the first and second differential phase information sequences, thereby obtaining a correlation result; and

a step of determining a synchronization between the first and second pattern sequences on the basis of the obtained correlation result.

2. The method according to claim 1, wherein

in the first correlation step a predetermined number Z of symbols of the first pattern sequence are correlated two at a time;

in the second correlation step Z symbols 1 to Z of the second pattern sequence are correlated two at a time; and

the second and third correlation steps are repeated and wherein, for each repetition m in the second correlation step, the predetermined number Z of symbols is shifted by one symbol so that Z symbols 1+m to Z+m of the second pattern sequence are correlated two at a time.

3. The method according to claim 1, wherein phase information due to a mismatch of frequency information between the symbols of the first pattern sequence and the symbols of the second pattern sequence is detected on the basis of the correlation result.

4. The method according to claim 1, wherein the symbols of the second pattern sequence are contained in a data symbol stream and are modulated in a different way from the data symbols in the data symbol stream, and wherein the method further comprises:

a step of detecting the symbols of the second pattern sequence in the data symbol stream on the basis of the different modulation.

5. The method according to claim 1, wherein, in the determining step, the second pattern sequence is received by a receiving device from a transmitting device, and the first pattern sequence forms at least a part of the second pattern sequence and is stored in the receiving device.

6. The method according to claim 1, wherein, in the determining step, the second pattern sequence comprises a sequence of IQ pilot symbols which are contained in a received data symbol stream and the first pattern sequence comprises a reference pattern sequence of IQ pilot symbols.

7. The method according to claim 6, wherein, in the determining step, the IQ pilot symbols comprise QPSK modulated symbols, and the IQ pilot symbols of the second pattern sequence are periodically inserted into the data symbol stream at the transmitting device.

8. The method according to claim 1, wherein, in the determining step, the second pattern sequence comprises a training sequence.

9. An apparatus for synchronizing with a pattern sequence, the apparatus comprising:

first correlation means for correlating symbols of a first pattern sequence, the symbols comprising amplitude and phase information, and outputting a first differential phase information sequence;

second correlation means for correlating symbols of a second pattern sequence, the symbols comprising amplitude and phase information, and outputting a second differential phase information sequence;

third correlation means for correlating the first and second differential phase information sequences, and outputting a correlation result; and

means for determining a synchronization between the first and second pattern sequences on the basis of the correlation result.

10. The apparatus according to claim 9, wherein

the first correlation means are arranged to correlate a predetermined number $Z$ of symbols of the first pattern sequence two at a time;

the second correlation means are arranged to correlate $Z$ symbols 1 to $Z$ of the second pattern sequence two at a time; and

the second and third correlation means are arranged to repeat the correlation operations; the apparatus further comprising:

shifting means for shifting, for each repetition $m$, the predetermined number $Z$ of symbols in the second correlation means by one symbol so that $Z$ symbols $1+m$ to $Z+m$ of the second pattern sequence are correlated two at a time.

11. The apparatus according to claim 9, further comprising:

means for detecting phase information due to a mismatch of frequency information between the symbols of the first pattern sequence and the symbols of the second pattern sequence from the correlation result output by the third correlation means.

12. The apparatus according to claim 9, further comprising:

storing means for storing the first pattern sequence.


13. The apparatus according to claim 9, further comprising:

means for detecting the symbols of the second pattern sequence in a data symbol stream.


14. A system for synchronizing with a pattern sequence, the system comprising:

a transmitting device which includes:

means for generating symbols of a pattern sequence to be used for synchronization; and

transmitting means for transmitting the symbols of the pattern sequence;

and a receiving device which includes:

first correlation means for correlating symbols of a reference pattern sequence, the symbols comprising amplitude and phase information, and outputting a first differential phase information sequence;

receiving means for receiving the symbols of the pattern sequence transmitted by the transmitting device;

second correlation means for correlating the received symbols of the pattern sequence, the symbols comprising amplitude and phase information, and outputting a second differential phase information sequence;

third correlation means for correlating the first and second differential phase information sequences, and outputting a correlation result; and

means for determining a synchronization between the received and reference pattern sequences on the basis of the correlation result.


15. The system according to claim 14, said transmitting device further

comprising:

first modulation means for modulating data of the pattern sequence to be used for synchronization, according to a first modulation scheme, thereby providing the symbols of the pattern sequence;

second modulation means for modulating payload data according to a second modulation scheme, thereby providing a data symbol stream; and

means for inserting the symbols of the pattern sequence into the data symbol stream.

16. The system according to claim 15, wherein the first modulation means are arranged to modulate the data of the pattern sequence according to QPSK modulation scheme, and the second modulation means are arranged to modulate the payload data QAM or TCM modulation scheme.

17. The system according to claim 15, wherein the inserting means are arranged to insert the QPSK modulated symbols periodically into the QAM or TCM modulated data symbol stream.

18. A computer program product, comprising software code portions for performing a method when the product is run on a computer, the method comprising:

a first correlation step of correlating symbols of a first pattern sequence, the symbols comprising amplitude and phase information, thereby obtaining a first differential phase information sequence;

a second correlation step of correlating symbols of a second pattern sequence, the symbols comprising amplitude and phase information, thereby obtaining a second differential phase information sequence;

a third correlation step of correlating the first and second differential phase information sequences, thereby obtaining a correlation result; and

a step of determining a synchronization between the first and second pattern sequences on the basis of the obtained correlation result.

19. The computer program product according to claim 18, wherein said computer program product comprises a computer-readable medium on which said software code portions are stored.

20. The computer program product according to claim 18, wherein said computer program product is directly loadable into the internal memory of the computer.

21. A system for synchronizing with a pattern sequence, the system comprising:

a transmitting device which includes:

a symbol generator for generating symbols of a pattern sequence to be used for synchronization; and

a transmitter for transmitting the symbols of the pattern sequence;

and a receiving device which includes:

a first processor for correlating symbols of a reference pattern sequence, the symbols comprising amplitude and phase information, and outputting a first differential phase information sequence;

a receiver for receiving the symbols of the pattern sequence transmitted by the transmitting device;

a second processor for correlating the received symbols of the pattern sequence, the symbols comprising amplitude and phase information, and outputting a second differential phase information sequence;

a third processor for correlating the first and second differential phase information sequences, and outputting a correlation result; and

a fourth processor for determining a synchronization between the received and reference pattern sequences on the basis of the correlation result.